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U.S. DEPARTMENT OF AGRICULTURE

ROCKY MOUNTAIN FOREST AND RANGE EXPERIMENT STATION

## Ammonium Nitrate Encourages Decomposition of Ponderosa Pine Needles Under Laboratory Conditions

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*Ammonium nitrate significantly affected litter decomposition; neither potassium phosphate nor Schubert's medium had an appreciable effect.*

A heavy layer of litter is associated with low forage production in the ponderosa pine forests of the Southwest. More rapid decomposition of this litter may result in increased forage production of forested lands. The use of chemical treatments to accelerate pine needle decomposition was studied by applying the treatments under laboratory conditions.

Ponderosa pine (*Pinus ponderosa* Lawson) needles were gathered from branches of a single dead tree to insure uniformity and to eliminate possible contamination by soil. Ten grams of needles were placed in dacron sacks and closed with a numbered tag. Dacron is not readily decomposed.

The basic macronutrient treatments were a graded series of ammonium nitrate solutions from 1 to  $1 \times 10^{-5}$  molar (M). To one set of ammonium nitrate solutions, potassium phosphate was added at one-tenth the ammonium nitrate concentration (table 1). To another set,

both potassium phosphate and Schubert's medium were added. Schubert's medium is designed to promote bacterial activity.

Four sacks of needles were soaked in each concentration of each treatment (table 1) for 75 minutes, and allowed to drain for 30 minutes. They were placed in a seed germinator and kept in a water-saturated environment at 80°F. After 2 months the sacks were oven-dried and weighed. These weights were compared to pretreatment weights.

Analysis of variance showed a significant difference between chemicals, but differences between rates, or rates times chemical interaction, were not significant. Tukey's multiple range test was used to compare treatment means (table 1). Ammonium nitrate had the most significant effect, with the 0.01M solution being the most beneficial for decomposition. Neither the potassium phosphate nor the Schubert's medium had an appreciable effect.

It seems apparent from these observations that ammonium nitrate encourages pine needle decomposition in the laboratory. Further studies are necessary to determine how decomposition is affected by moisture and temperature, as well as the effect of these factors upon ammonium nitrate.

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Table 1.--Decomposition of 10-gram pine needle samples as influenced by kind and amount of chemicals

Chemical and concentration	Mean weight loss	Significant differences <sup>1</sup>
	<u>Grams</u>	
Ammonium nitrate (NH <sub>4</sub> NO <sub>3</sub> )		
.01M	2.26	a
.001M	2.14	ab
.0001M	2.11	ab
1M	1.97	abc
.1M	1.87	bcd
Ammonium nitrate + Potassium phosphate (NH <sub>4</sub> NO <sub>3</sub> + KH <sub>2</sub> PO <sub>4</sub> )		
.01M + .001M	2.01	abc
.1M + .01M	1.93	abc
.001M + .0001M	1.93	abc
.0001M + .00001M	1.82	bcd
1M + .1M	1.79	bcd
Ammonium nitrate + Potassium phosphate + "Schubert's medium" <sup>2</sup>		
.0001M + .00001M + 25 ml	1.97	abc
.01M + .001M + 25 ml	1.93	abc
.001M + .0001M + 25 ml	1.87	bcd
1M + .1M + 25 ml	1.83	bcd
.1M + .01M + 25 ml	1.76	cd
Checks	1.79	bcd

<sup>1</sup>Results from Tukey's multiple range test p. 251 from Snedecor, G. W. Statistical methods, Ed. 5, Ames: Iowa State Coll. Press. 1956. Letters indicate no significant difference from other treatments with the same letter. Difference of means greater than 0 = 0.36 were significantly different at the 5 percent level.

<sup>2</sup>In this study, Schubert's medium included 2.5 grams of MgSO<sub>4</sub>, 5 grams of peptone, 7.5 grams of KH<sub>2</sub>PO<sub>4</sub>, and 10 milligrams of thiamin HCl, dissolved in 500 milliliters of tap water. Twenty-five milliliters of this medium were added to 500 milliliters of the graded ammonium nitrate solutions. See Ishikawa, H., Schubert, W. J., and Nord, F. F. Investigations on lignins and lignification. XXVII. The enzymic degradation of softwood lignin by white rot fungi. Arch. Biochem. Biophys. 100: 131-139. 1963.